Ash Dieback in the Northeast

by Robert W. Brandt

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Cause for Concern

A DIEBACK condition among our ash trees is causing great concern among foresters and forest industries in the northeastern United States. There is good cause for concern. For example, a recent survey made by the New York Conservation Department in 18 eastern counties of the State revealed that about 70 percent of the woodland ash trees are dead or dying.

A number of other northeastern tree species suffer from similar but less serious disorders. Sugar maple, red oak, sweetgum, black cherry, and shagbark hickory show symptoms of various sorts of dieback. It is not known how their troubles relate—if at all—to the dieback of ash.

The economic importance of ash as a timber tree sharpens the concern over the dieback. The demand for ash has been increasing steadily. In 1957 the Census Bureau reported 97 million board-feet of ash lumber produced in the eastern United States. In 1958, production was 114 million board-feet; and by 1959 production had risen to 140 million board-feet.

Besides the ash that goes into lumber, a nearly equal amount is estimated to be used in the manufacture of athletic equipment,

furniture, tool handles, wooden ware, novelties, turnings, and veneer for interior panelling. For one striking example: nearly all baseball bats (95 percent) are made from white ash; and nearly 6 million bats are manufactured annually. For some people there is a serious question: If the supply of white ash goes, what shall we do for baseball bats?

The dieback attacks both white ash (*Fraxinus americana*) and green ash (*F. pennsylvanica*), but by far the greater damage is being done to white ash. Ash trees of all ages are attacked, from 15-year-old saplings to mature trees more than 150 years old. In tree size this can be expressed as from ½ inch to 45 inches in diameter at breast height. The dieback seems to strike everywhere: trees in hedgerows and along the roadside, in open fields, in farm woodlots and in the forests, among shade trees and ornamental plantings. A vast number of valuable ash trees are already affected by the dieback, and there is every indication that the situation will worsen. In the years during which forest pathologists have been observing the disease, no tree once infected has been known to recover.

It should be said, though, that not every ash tree is necessarily doomed. Even where the outbreaks have been most severe, healthy and fast-growing individual trees may stand surrounded by dead and dying neighbors, many of which have been diseased for years (fig. 1).

History and Distribution

The earliest known record of ash dieback as a problem was cited by R. Pomerleau of the Laboratory of Forest Biology at Laval University, Quebec, Canada, in his report to the 1952 Symposium on Birch Dieback held at Ottawa (1953). He observed typical ash dieback symptoms as early as 1925 and reported seeing "the rapid decline of ash in several areas of southern Quebec" and also that ash "mostly of the swamp species, were largely destroyed in the St. Lawrence Valley, from the vicinity of Quebec City to the border of the United States, especially in the eastern townships."

Figure 1.—A pure stand of white ash in a woodlot near Millbrook, New York. Dead, dying, and apparently healthy ash trees are intermixed throughout the area.

In 1930, R. P. Marshall (1930) reported observing, over a 2-year period, a similar condition in white ash in Maine, New Hampshire, Vermont, Massachusetts, Rhode Island, Connecticut, New York, and Pennsylvania. Trees appeared low in vigor, foliage was thin, and much dead wood was evident, particularly as a killing of twigs and smaller branches. Death of medium-sized trees was said to be common.

Twigs and branches of diseased ash were examined mycologically by Reddy *et al* (1934), in a survey of tree diseases in Iowa. Roughly 60 percent of the ash were found to be in a state of decline. *Cytospora annularis* was the most common fungus associated with this dieback of ash.

Figure 2.—Extremely thin foliage can be a symptom of ash dieback. The cluster in the foreground and the two trees at the right are diseased.

A further report on the results of the above-mentioned survey was brought forth by J. C. Gilman, *et al* (1936). The genus *Cytospora* was the most frequently cultured of some 87 different genera of fungi from cankers found on 47 different species of host trees. Final figures from the survey indicated that green ash was second only to white pine among trees seriously threatened by diseases.

Ash dieback was noted as becoming increasingly severe in central New York over a 15-year period (Silverborg and Brandt,

1957). This occurred in roadside and hedgerow trees and more recently in forest stands. The disease was found on white ash of all age classes from sapling size to trees 2 feet in diameter. A fungus, *Cytophoma pruinosa*, was isolated from diseased trees; reinoculated into healthy trees, it was found to produce typical dieback symptoms.

In April 1960, D. S. Welch of Cornell University reported (personal communication) that symptoms in ash had been observed in 23 out of 60 New York counties inspected. The disease had generally appeared in older trees.

Results of a New York Conservation Department survey in the summer of 1960 were presented at the New York Forest Pest Meeting in March 1961 by Dr. S. B. Silverborg, who headed the survey. He revealed that up to 64 percent of the ash throughout 18 eastern counties and 70 percent in the commercial forests of the same area were in various stages of the disease.

The disease is currently known to extend from the Maine border to western New York and Pennsylvania. Damage is particularly severe along the Hudson River valley in southeastern New York.

Overseas, the Russian pathologist Koval (1960) reported that *Cytospora* (*Cytophoma*) *pruinosa* was causing considerable damage through systemic infection of white ash in eastern Siberia. Infections occurred on approximately 45 percent of the trees observed over a period extending from 1955 to 1958.

Symptoms

The disease may first become noticeable in late spring as a pale yellow-green appearance of the foliage. Individual leaflets are abnormally small and totally off-color. In some instances, the overall thinness of the foliage of a tree may be more noticeable than color differences (fig. 2). Certain trees will foliate and remain fully leafed and green throughout, but isolated branches—usually in the uppermost crown—will fail to leaf out in spring. With either type of initial symptoms, bud failure and progressive dying back of small twigs soon occurs.

Whether infection occurs through healthy or cold-injured bud scars and lenticels is still uncertain, but it is known that the disease begins in the very tipmost portions of the small twigs and works progressively to larger branches. Sharp lines of demarcation between dead and living tissues may be found at any time, thus clearly defining the extent of the disease on any one branch. Efforts made by the tree to overcome the disease are shown by the formation of callus ridges, particularly at the juncture of a small limb with a larger. In addition to these abortive attempts to callus off the infected members, the tree may produce epicormic branches farther down the branch or stem.

Eventually, in a matter of months or years, the trees shed their smaller, diseased-killed twigs and branches, thus becoming stag-headed and ofttimes completely bare of foliage except for that close to the main stem. Trees may exist in this state for several years. Excavation of roots of a number of trees in this condition has revealed a highly developed, fibrous, healthy-looking root system comparable to those of obviously unaffected trees.

Fairly conspicuous reddish-brown cankers are usually formed at the base of twigs and branches as the disease spreads to each succeeding branch. A single branch may show a series of these cankers, each centered about its point of initiation—the smaller lateral twig. Such cankers enlarge to coalesce with one another or to completely girdle the branch. In any event, the disease continues its way toward the main stem. Death of twigs, branches, and limbs continues rather rapidly. The majority of trees are completely killed within 2 to 7 years following the appearance of the first visible symptoms.

The Cause

Ash dieback has been under extensive investigation by the Division of Forest Disease Research, U. S. Forest Service, for 2 years; and the cause has not been definitely determined. Dying back of the branches and the formation of cankers is regularly associated with the fungus *Cytophoma pruinosa* (Fries) Höhn. This fungus is closely related to the genus Cytospora and is, in

fact, considered by many (Koval, 1960) to belong to that group, thus making the name *Cytospora pruinosa.*

The small pinhead-size fruiting bodies or pycnidia of the fungus may or may not be present on the reddened necrotic branches and cankered areas, but in any case the fungus can consistently be isolated from the recently killed host tissue. Pycnidia are produced in great numbers by the fungus, and in damp or rainy weather thin columns of spores are forced from them. These spores then apparently spread to other portions of the tree or to other trees, where they may infect susceptible twigs.

Cytophoma pruinosa has been cited in the literature as a saprophyte and as a weak to moderate parasite on ash. It is found on lower branches of apparently healthy trees and appears to play a part in the early self-pruning of ash. The fungus is seemingly omnipresent where ash is found, and indications are that it has become a killer through a general decline in vigor on the part of the host. Indeed, most increment-core readings and ring counts made on stumps of felled trees have revealed that tree growth had slowed considerably several years previous to the appearance of dieback symptoms. It is now believed that some widespread environmental change has caused losses in host vigor, which in turn permit outbreaks by this organism that normally is of little importance.

Recommendations

Forest managers in the afflicted areas should learn to recognize the disease if ash is a valuable component in their forest stands. Dead and dying trees should be salvaged if at all possible, not in the hope of eliminating the disease, but purely in the wise and economical use of a valuable natural resource. A short cutting cycle of about 5 years is recommended for known trouble spots so that the losses will not be too great. Periodic inspection of heavy concentrations of ash should be made to detect outbreaks of the disease.

Markets for white ash at this time seem to be unusually favorable. Sawlogs down to 8 or 9 inches top diameter are being taken

by many mills, and pulpwood producers are using ash along with other hardwoods. Salvage of the diseased and dying trees should be fairly prompt, because this species deteriorates rather rapidly.

There is a need for intensification of research on ash dieback. Such work should be centered around the fungus (its pathogenicity, the extent of its association with the disease, and a possible method of control); the host vigor (soil fertility, fertilization, minor element deficiencies); and the weather history over the past two decades (temperature and rainfall relationships, with particular emphasis on moisture deficiencies).

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